



UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/320,271	05/27/99	WATANABE	H 990559

023850 MM91/0927  
ARMSTRONG, WESTERMAN, HATTORI,  
MCLELAND & NAUGHTON, LLP  
1725 K STREET, NW, SUITE 1000  
WASHINGTON DC 20006

EXAMINER

LEE, C

ART UNIT	PAPER NUMBER
----------	--------------

2825

DATE MAILED:

09/27/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.  
**09/320,271**

Applicant(s)  
**H. WATANABE et al.**

Examiner  
**Calvin Lee**

Art Unit  
**2825**



-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1) ☒ Responsive to communication(s) filed on Sep 4, 2001

2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

## Disposition of Claims

4) ☒ Claim(s) 1-13 and 21 is/are pending in the application.

4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.

6) ☒ Claim(s) 1-13 and 21 is/are rejected.

7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.

8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirements.

## Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.

11) ☒ The proposed drawing correction filed on May 27, 1999 is: a) ☒ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☒ All b) ☐ Some\* c) ☐ None of:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

15) ☐ Notice of References Cited (PTO-892)

18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

19) ☐ Notice of Informal Patent Application (PTO-152)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_

20) ☐ Other: \_\_\_\_\_

**OFFICE ACTION**

***Response to Pre Amendment***

1. The addition of claim 21 received on September 4, 2001 is acknowledged.

***Claim Rejections - 35 USC § 102***

- 4 2. Claims 1-13<sup>and 21</sup> are rejected under 35 U.S.C. 102(e) as being anticipated by *Mizuhara et al.*  
or *Watanabe et al.*

- a) *Mizuhara* discloses a semiconductor device and its method, comprising the steps of:
- forming an organic SOG layer 9 as a first insulator, having substantially uniform thickness, on an oxide film 8 and over a flat substrate's face (Figs. 4-5 and col. 4, lines 25-43)
  - introducing impurities B<sup>+</sup> into the organic SOG layer (so the impurities arrive at the interface between the SOG layer and its underlying oxide), thereby modifying the organic SOG layer 9 to an SOG layer 10 (Fig. 6 and col. 4, lines 45-51)
  - forming a trench 12 in the modified SOG layer using a mask pattern (col. 4, lines 58-62)
  - embedding and forming a first conductive layer 13 of copper alloy in the trench (col. 5)

The method can extend to have second, third, and fourth interconnections, as desired, by repeating the above steps (col. 5 line 61 through col. 6 line 62).

- b) *Watanabe* teaches a fabrication method of a semiconductor device, comprising the steps:
- forming a first insulating layer 8 of organic SOG, containing 1% of carbon, on an oxide film 5 and overlying a substrate 1 (col. 5 line 17 through col. 6 line 30)

- introducing impurities into the insulating layer (Fig. 4) so the impurities arrive at the interface between the insulating layer and the oxide film (col. 6, line 39 and col. 7, line 32)

Note: the implantation at the interface between organic SOG layer **8** and oxide film **5** prevents modified SOG layer **9** (col. 6, line 53) from being easily peeled off from the oxide film (col. 6, lines 52-59 and col. 7, lines 30-37)

- forming a trench **10** in the insulation layer (col. 8 lines 52-63)

- embedding and forming a first conductive layer **11** over the trench (Fig. 5 and col. 7 lines 9-29)

The method can be repeated to form a conventional multilayer structure having second, third, and fourth interconnections, as required.

### ***Response to Arguments***

3. Applicant's argument that "*Mizuhara et al.* and/or *Watanabe et al.* do not teach forming a trench in the insulating layer" is unpersuasive. However, note in the rejection above, that the specific portions of *Mizuhara* or *Watanabe* about forming a trench in the insulating layer, relied upon by the Examiner to reject the claims, have been pointed out in details.

Therefore, Applicants' arguments are moot in light of the new rejection.

4. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire three months from the mailing date of this action. In the event a first reply is filed within two months of the mailing date of this final action and the advisory action is not mailed until after the end of the

three-month shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than six months from the date of this final action.

***Contact Information***

5. Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (703) 306-5854 from 7:00AM to 5:00PM (Monday through Thursday). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* whose telephone number is (703) 308-1323.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 or (703) 306-3329.

CL

September 27, 2001



MATTHEW SMITH  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800